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THE EXPLOSIVES ENGINEER

Forerunner of Progress in Mining, Quarrying, Construction

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Views and opinions expressed by the authors of articles in this publication are their own, and they do not necessarily represent those of the publisher.

IN an address before 1,400 members and guests of the American Institute of Mining and Metallurgical Engineers in New York, on February 15, 1950, Dr. Donald Hamilton McLaughlin, newly elected president of A.I.M.E. for 1950, stated that the emphasis on security, above all other objectives of life, is one of the most debilitating influences of the times. This emphasis on security has promoted extravagance and deception, as well as weakened the old competitive force that spurs men to new achievements.

A condensed report of the address entitled "Security Versus Opportunity" appears on page 39.

STRIP-MINING coal is an important feature in Penowa Coal Company's schedule of operations. However, it was necessary to examine other means of coal recovery at its Collier, West Virginia, mine because of a continuing increase in the height of overburden covering the coal. A report on how it solved the problem successfully to develop a daily tonnage production of 2,500 tons is presented by J. F. Hastings, beginning on page 40.

LOUIS HEINZMAN, whose original drawings depicting the majestic grandeur of Death Valley are reproduced beginning on page 47, is recognized by mining men and geologists as one of the outstanding artists of the American Western scene.

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SOME of the details involved in the successful application of modern explosives and blasting techniques in the construction of the new roadway from Trona, California, to Death Valley, together with a historical resumé of the fabulous region, are included in the article by George H. Sturtevant, beginning on page 45. Mr. Sturtevant is the author of many articles on the desert regions of California.

THOUSANDS of visitors came to the little mining town of Jermyn, Pennsylvania, on December 13, 1949, to join with local miners and their families in commemorating the 50th anniversary of the founding of first-aid training in the United States. An outline of the start of the movement by Dr. Matthew J. Shields, and how it grew to national proportions, is related in the article on page 43.

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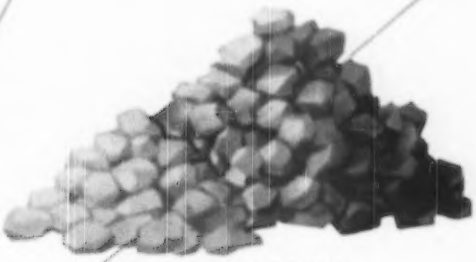

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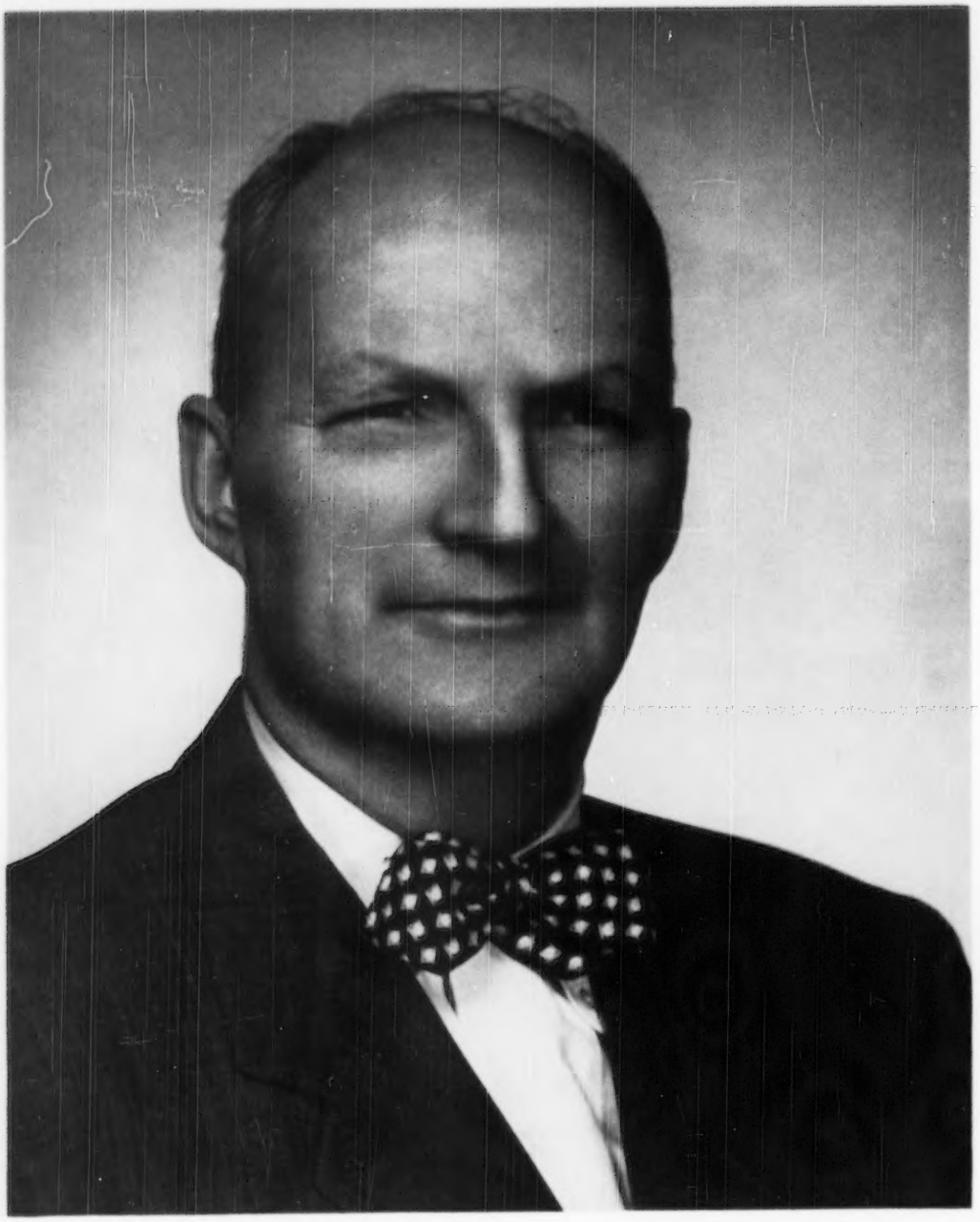


JAMES REID CALLANAN

James Reid Callanan

PRESIDENT
THE CALLANAN ROAD IMPROVEMENT COMPANY

A Biography

The subject of this sketch is one of those rare individuals who combine remarkable skill as a musician and concert pianist, and unusual business acumen. His success as guest soloist with the Albany Symphony Orchestra in 1947, and his election to the presidency of the National Crushed Stone Association for 1950 illustrate his versatile talents.

Reid, as his friends and associates know him, was born in South Bethlehem, Albany County, New York, August 31, 1895, the son of Peter and Hannah Callanan. His father founded The Callanan Road Improvement Company in 1883 and incorporated it in 1895. After her husband's death one year later, Mrs. Callanan took over the management of the company's affairs, at the same time raising a family of six children, of whom Reid was the youngest.

After attending local public schools, Reid entered Mohegan Lake School at the age of fifteen, from where he was graduated in 1914. During those early, formative years, he gave evidence of an unusual talent for playing the piano. He began the serious study of this instrument as a boy, with the thought of becoming a concert pianist.

In the fall of 1914, he enrolled at Princeton University where he made the football and baseball teams, and sang in the Glee Club. However, the urge to pursue further studies of music and the piano resulted in his withdrawal from the university to concentrate in that field.

Upon our entrance into the first World War, Reid enlisted in the U. S. Army, was assigned to the 77th Division and, subsequently, was an instructor at Camp Zachary Taylor, Louisville, Kentucky. When the war was over, he received his discharge as a captain of Field Artillery.

After his return to civilian life, he decided to devote his efforts to the promotion of the family's crushed-stone business. He returned to Princeton to complete his formal education, arranging his courses of study so that he could spend part of the time at the South Bethlehem quarry. He was graduated from Princeton in 1923, at the age of twenty-seven—a not uncommon age for many war veterans.

While in army uniform in 1918, Reid attended his first convention of the National Crushed Stone Association. It was held in Albany and was the second annual meeting of the members of the national association. Since then, he has attended most of the conventions. In 1935, he was elected to membership on the board of directors of NCSA and has served continuously in that capacity from that time. In 1940, he was made a regional vice president of the association; in 1950, he was elected its president.

After serving as a member of the board of directors of New York State Crushed Stone Association for many years, Mr. Callanan was elected its president in 1939-1940. He was made chairman of the Advisory Policyholders of the State Fund of New York in 1947, following a long-time membership. When Associated Limestone Producers of the Northeast, Inc., was organized in 1949, he was made its first president. This group includes most of the active agricultural limestone operators in seven states. He was elected a board member of the National Slag Association in 1947, and has been re-elected in each succeeding year.

Reid's other business associations include the presidency of Callanan Slag & Materials Company, Inc., Troy, New York, owned jointly by Republic Steel Corporation and The Callanan Road Improvement Company.

For many years, Mr. Callanan has been prominently identified with the affairs of the Albany Symphony Orchestra, functioning as its president or the chairman of the board since 1945. He was honored in 1947 by being selected as guest soloist with the orchestra, playing Gershwin's "Rhapsody in Blue."

James Reid Callanan married Marion McCutcheon, in Peekskill, New York, October 9, 1917. The family home is in Loudonville, New York. They have one son, Charles Reid Callanan, a 1949 Princeton graduate. He is general manager of the Nashville Civic Music Association, the sponsor of Nashville's orchestra and choral society.

Reid's club affiliations include Schuyler Meadows in Loudonville and Fort Orange in Albany.

Playing the piano is Reid Callanan's favorite hobby. He also finds relaxation from the demands of his varied business interests in playing golf, whenever time and opportunity will permit such diversion.

Editorial

The Outlook for Mining

In an address before the members of the American Zinc Institute in St. Louis, April 11, Dr. James Boyd, director of the U. S. Bureau of Mines, reviewed the outlook for mining. In his opening remarks, he said that the age in which we live is an uncertain one. "We are not only in a state of political transition throughout the world but we are also undoubtedly in an important period of technological change."

Dr. Boyd stated that it must be obvious that mining has been influenced to a high degree by political and economic events, many of which are of such a nature that the mining industry has relatively little influence in shaping them.

Continuing, he said, "I cannot present too optimistic a picture to you for the immediate future, although I feel that from the long-range standpoint one need not be pessimistic about the future of the mining industry. The population of the United States is continuing to increase and with it has come an expanding consumption of metals on a per capita basis. With this expansion there has and will continue to come the demand for more goods and increased products from our mines and fabricating plants.

"As long as domestic industrial production continues to expand," he said, "I think there is no doubt that there will be increased need for metals. If we compare a critical index—automobile and truck production—we find that in 1941 the United States produced on an average of 98,236 trucks and automobiles each week. Today our average weekly production is over 127,000. Business Week states that the weekly electric power output in million kilowatt hours averaged in excess of 3,000 for the year 1941. A month ago the weekly average was nearly double that of 1941. I think that you will agree with me that these figures indicate that the country is not retrenching—that industry itself is expanding. It must be evident that in order for it to function effectively under such conditions of expansion, metals will be needed."

In conclusion, Dr. Boyd remarked, "In order that the mining industry remain strong, it is vitally necessary that during this period of transition it turn its attention to preparing for the future. . . . Our reserves have not been developed at the desired rate. The need for encouraging exploration must become more fully recognized. If the point is made clear to the public and the Government, and not clouded by extraneous issues and the problems of individual operators, there is some hope for constructive action. This includes not only support of exploration for new and extended deposits, but also for technological improvements so that today's marginal ores will become the reserves of tomorrow."

The 1950 Coal Convention

As we go to press, advance reservations indicate that approximately 2,000 mining men from all parts of the country will gather in Cincinnati, Ohio, April 24 through 26, at the Netherland Plaza Hotel, to attend the 1950 Coal Convention of the American Mining Congress.

The program includes general sessions and group forums for the examination and discussion of important phases of deep and strip mining in flat and pitching seams in the anthracite and bituminous fields, and the complete cycle of surface operations. Special attention will be given to the adaptation of new mining practices and new machinery, safety in the mines—with particular emphasis on the reduction of accidents—and improved public relations. Economic questions of wide general interest will be discussed to a greater extent than ever before.

A high level of business activity has been forecast for 1950. To realize this objective, a high level of production in the coal industry must be maintained. Everyone interested in the mining of coal should participate in this three-day meeting in Cincinnati, to keep abreast of new developments and technical advances, and to help seek ways and means of maintaining coal's rightful position in our economy.

40,000 Miles of Pipe Lines

More than 15,000 miles of pipe lines were laid in the United States in 1949, for the transportation of oil and natural gas. The program for 1950 calls for 40,000 miles of pipe of various sizes. Some of this will be laid in rocky country, across rugged hills, and through river beds.

Much of the work of preparing the ditches for the installation of the pipe will involve blasting rock and hardpan. Explosives manufacturers are prepared to supply the dynamite and blasting supplies required for these projects. Explosives engineers will cooperate with the contractors in carrying out this ambitious program, economically and speedily.

The George S. Bartlett Award

The George S. Bartlett Award, the highest national honor of America's highway industry and profession, was awarded to Minnesota Highway Commissioner M. J. Hoffman, at the 47th annual meeting of the American Road Builders' Association, March 8, 1950, at the Netherland Plaza Hotel, Cincinnati, Ohio. More than 1,500 leaders in the highway field were in attendance.

The Bartlett award, established in 1931, is conferred annually upon an individual who has made an outstanding contribution to highway progress.

SECURITY VERSUS OPPORTUNITY

When security is emphasized above other objectives of life, an unhappy moral condition is likely to result

DR. DONALD HAMILTON McLAUGHLIN*

High lights of an address by Dr. McLaughlin, president of the American Institute of Mining and Metallurgical Engineers for 1950, at the 170th annual meeting of the members and guests of the Institute in New York City, February 15, 1950.

BY TRADITION, mining engineers are rightly regarded as men who value the opportunity to create new wealth and to enjoy its benefits far more than mere security. In these days when elections are won on promises of complete protection from the cradle to the grave, our profession can take pride in serving as an example of the spirit of daring and adventure that must dominate our minds, if we are to persist and move ahead under our own cherished concept of freedom.

The emphasis on security above all other objectives of life . . . is one of the most debilitating influences of the times. We all, of course, want some measure of security but when this desire is uppermost and dominant in men's minds, a nation stagnates. Most of us in our profession do our best to earn enough to provide adequate protection for our own old age and for our dependents. We recognize personal security as a reasonable need and as an incentive to accumulate the means to provide it. Furthermore, we are not indifferent to the responsibilities of a government to prevent suffering and to provide a measure of protection for those members of society who, for one reason or another, have fallen too far behind to meet their basic needs.

But, when security for all becomes the dominant consideration of both the electorate and the government, and when the promised benefits are so comprehensive that a vast segment of the population might be induced to lessen its efforts to support itself fully and simply to relax and enjoy what comes its way, a most unhappy moral condition is likely to result.

I might point out in passing that if we had . . . the will to submit to the impersonal discipline of gold, financial promises could be kept within bounds more easily and the realities of our present and prospective resources could be realized and wisely utilized without deluding ourselves or the prospective beneficiaries. Restoration of a gold standard in itself would not correct the evil. It would, however, serve to reveal the falseness of some of the promises, and perhaps make it easier, politically, to revise them and then keep them after they have been adjusted to attainable dimensions.

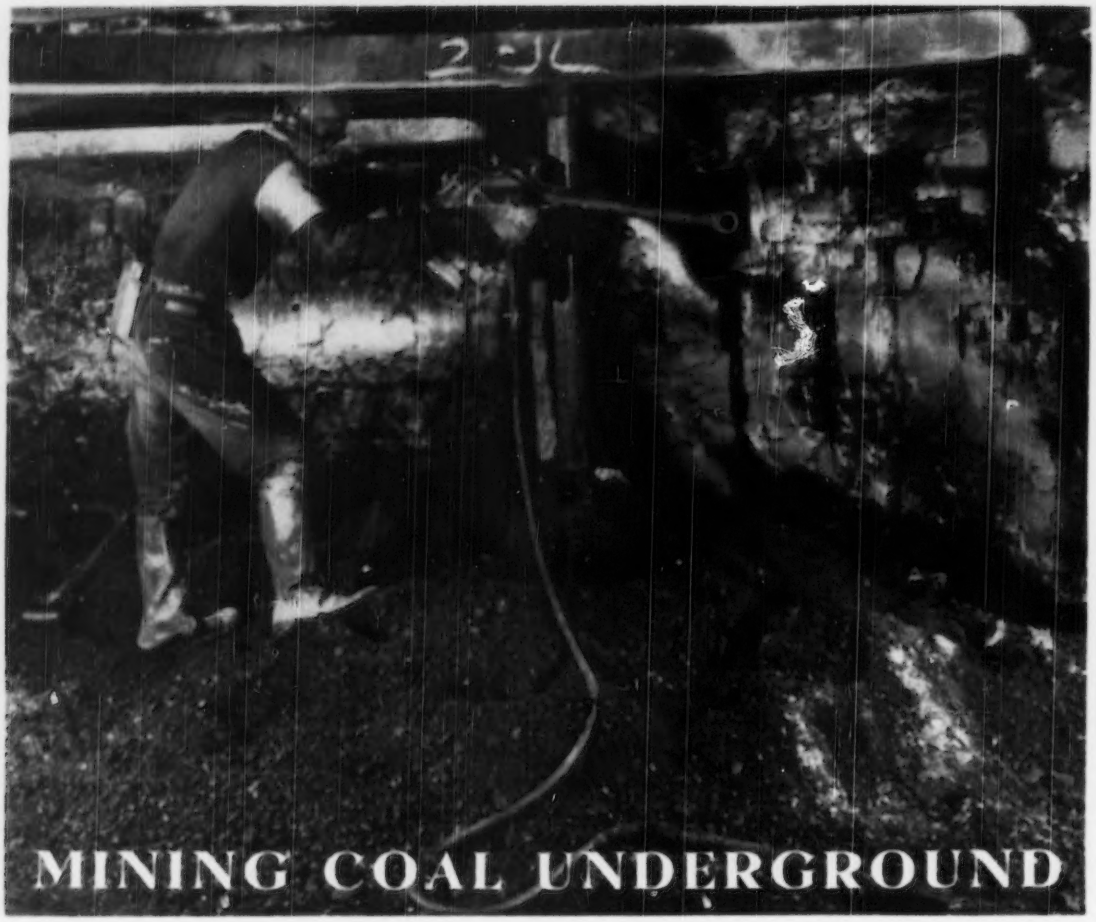
DR. DONALD HAMILTON McLAUGHLIN

To summarize, I feel most strongly that in emphasizing security we have merely promoted extravagance and deception as well as weakened the old insistant competitive force that spurs men to new achievements.

The mining industry, and the mining-engineering and related professions are surely no place for anyone who wants security above everything else. Of course, we are perhaps not quite so rugged as we were in the old days in Peru, when after sixty years of service a mining engineer, or even a geologist, might expect to be given a llama and a poncho and turned loose in the Andes. But, we are a breed of cat that must be looking for new things, new ore bodies, new ways to recover the metals and fuels, and new ways to use them.

(Continued on page 60)

*President, Homestake Mining Company, Lead, South Dakota.



MINING COAL UNDERGROUND

at Collier, West Virginia

A summary of Penowa Coal Company's operations that produce 2,500 tons a day

J. P. HASTINGS*

HOLES FOR BLASTING. After the 6-in. kerf has been undercut to a depth of 9 ft., a Chicago Pneumatic drill is utilized to drill three holes for blasting in a 16-ft. room.

PENOWA COAL COMPANY began operations in its first strip mine in 1938, at Penowa, Pennsylvania, close to the state border line of Pennsylvania and West Virginia. Activities were confined to one pit, utilizing a power shovel for stripping and loading the coal, a dozer, and a limited number of automobile trucks. From that modest beginning, the development of the company's enterprises in the ensuing years has been both progressive and substantial. Enlarged facilities, diversified equipment, and capable management made possible the production of millions of tons of coal during the recent war years, and in the post-war period.

While strip-mining coal continues to be an important feature in Penowa's schedule of operations, a continuing increase in the height of overburden covering the coal at its mine at Collier, West Virginia, made it imperative that other means of coal recovery be examined. The coal was of metallurgical analysis, and of a quality that would receive a ready market. After stripping the overburden, the mine area contained an island of coal acreage, with several million tons of available coal that could be recovered by deep-mine methods. The lengthy highwall and the exposed coal seam made deep-mining operations attractive and desirable. After exploring many mechanical methods, the management decided on the conveyor method of coal transportation, instead of the more generally used mine-car haulage system. They were influenced, primarily, by the fact that

*Hercules Powder Company, Pittsburgh, Pennsylvania.

the maximum distance of 1,800 ft. from the farthest working face to the outside could be served best by a continuous haulage belt.

The method of recovering the coal at the Collier mine is in accord with a prearranged operating plan submitted by the company's engineering department covering the entire mine acreage. It provides for the development of a three-entry system for each mine unit, with work rooms driven at right angles to the entries. One entry is utilized for the main haulage conveyor belt; the other two for supply requirements and for ventilation.

Three in One

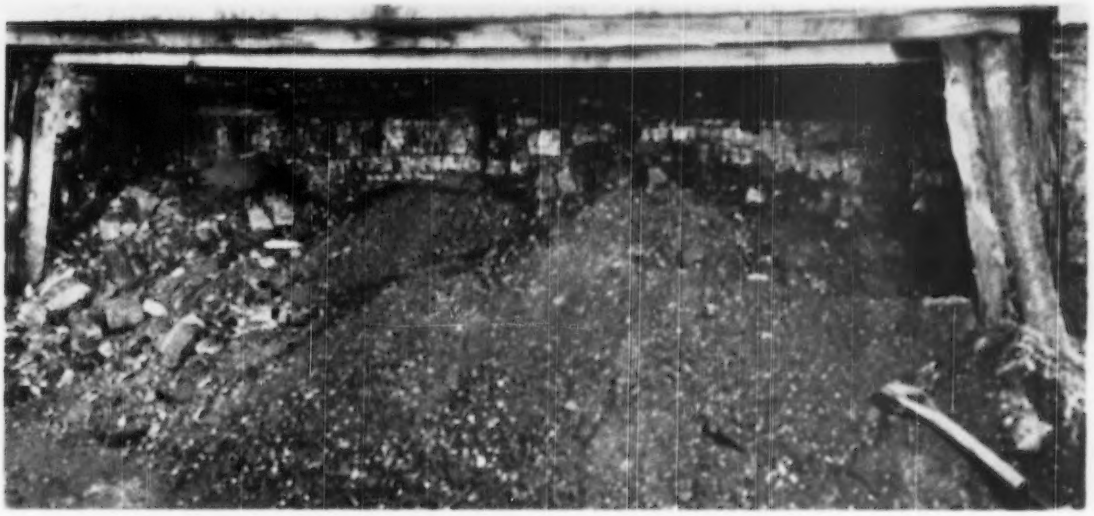
The extensive stretch of highwall makes possible the effective mining of all three units at one time, even when they are in various production stages. One unit may be at peak output; another may be on declining production; and the third unit may be in the early development stage. The combined operations of the three mine units contribute to the total daily production.

As the coal from one mine unit is depleted, another entry is prepared farther down the highwall. Such flexibility in operations is possible because of the portability of facilities. Equipment can be transferred quickly from an old location to a new one.

The underground operating cycle

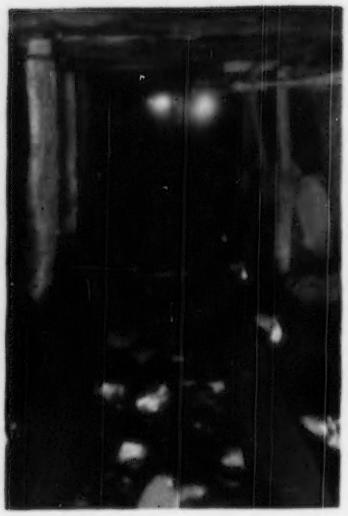
*Reg. U. S. Pat. Off.

LOADING THE EXPLOSIVES: A cartridge of Red H* L is being loaded into one of the drill holes at a working place. The explosives in each hole are primed with an electric blasting cap.

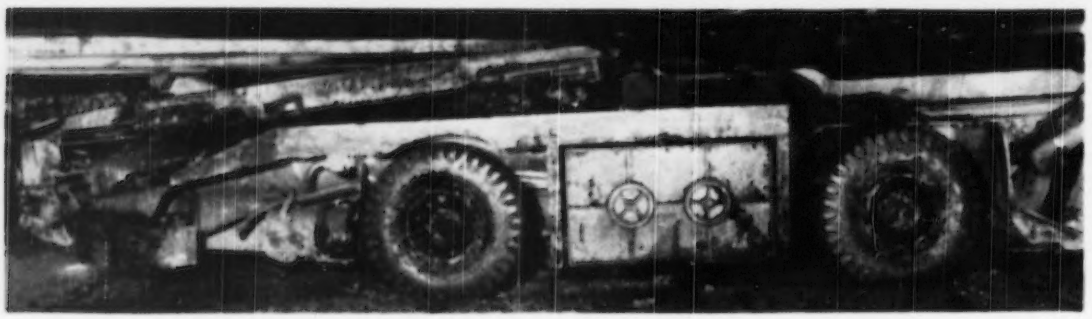


AFTER A BLAST: The blast produced the desired percentage of lump coal, with excellent loadability. The fine material on top of the pile is "bug dust" from the kerf.

RECOVERING COAL: At one of the working places underground, miners hand-load coal onto a Goodman G-15 shaker conveyor.



BELT CONVEYOR: A section of the 30-in. main conveyor belt that transports coal from underground working places to the outside.



MECHANICAL LOADING: After a blast in one of the rooms, a Joy 8 BU loading machine is put to work loading coal onto a Lee Norse Coalmobile.

in this 48-in. seam of coal includes the undercutting of a 6-in. kerf to a depth of 9 ft., the drilling and blasting of three holes in an average 16-ft. room, using predetermined charges of permissible explosives, and the excavating and loading of the blasted coal by Duckbill conveyors. The conveyors also deliver the product to a 30-in. main conveyor belt, for transportation to the outside. Additional equipment units include Joy 8 BU loading machines, with Lee Norse Coalmobiles that deliver the coal to the belt for haulage to the outside. From the loading bins on the surface, the coal is transported by Euclid trucks over company-built roads to a

(Continued on page 58)

LOADING BIN: Coal from a loading bin on the surface has been chuted into a Euclid truck. Note the three entries to one of the mine units, at the base of the highwall at left.

COAL MINERS PAY TRIBUTE TO THE FOUNDERS OF FIRST AID

Thousands witness ceremonies commemorating the 50th birthday of first-aid training in the United States

EDWARD PINKOWSKI*

JUDGED by its approximately 3,000 inhabitants, Jermyn is a relatively small mining village situated in a valley in Pennsylvania's anthracite district. But, on December 15, 1949, thousands of visitors came to town to witness ceremonies planned by a local committee, to commemorate the 50th anniversary of the beginning of first-aid training in the United States.

*1705 Race Street,
Philadelphia 3, Pennsylvania

A colorful parade with martial music, speeches by prominent leaders in industry and government, and the placing of a floral wreath at a monument by two members of the original first-aid class highlighted the program of the town's commemorative activities.

The granite monument, erected to the memory of America's pioneers in first-aid training, on a plot next to the Community House, makes the miners and storekeepers, the housewives and children of Jermyn, proud of their town's heritage.

In October, 1899, when Dr. Matthew J. Shields, a general practitioner in the village, stood on a dais in the second-floor hall of a Jermyn hotel and talked to the local miners about the anatomy of the human body, first-aid training was unknown in this country. At the conclusion of his remarks, Dr. Shields offered to teach the miners how to apply first-aid treatment to one

THE FINALE: In the evening, close to 350 guests gathered in the Jermyn High School auditorium, to attend a banquet at candle-lighted tables.

HIGH SCHOOL BAND: Led by petite majorettes, the Archbald High School band contributed martial music to the colorful parade.

another when an accident occurred. Twenty-four of the men volunteered for instruction and a class was organized. The significance of this training course became apparent after a few years, and similar classes were formed throughout the nation during the years that followed.

Once a week Dr. Shields taught the 24 members of his first class what to do in case of an accident—how to stop bleeding, how to bandage a wound, how to treat shock, and other on-the-job first-aid applications. He demonstrated remarkable ability in utilizing the scant resources of the town. His driving enthusiasm won the support and cooperation of mine operators, civil authorities, and military officials.

In 1910, The American Red Cross adopted first-aid training courses and set up classes of instruction in every state in the Union. A short time later, the U. S. Bureau of Mines joined in the movement and took first-aid down into the depths of the earth.

Since those early days, first-aid has assumed national proportions. In 1948, close to 500,000 people completed first-aid and accident-prevention training courses through the Red Cross, while thousands more received instructions from the U. S. Bureau of Mines personnel. Operators and safety engineers in the coal industry have helped to stimulate and maintain the interest of workers in the mines by conducting first-aid competitions each year, with prizes and trophies for the winning first-aid teams.

IN GRATEFUL MEMORY: Two members of the original first-aid class, Edward N. Stuart, left, and James O'Dowd, placed a wreath at the monument. Edison Thomas, right, was chairman of the day's activities.

In Memory of Dr. Shields

In 1943, the citizens of Jermyn began to discuss plans for the erection of a monument in memory of Dr. Shields and his first students. The leader of the movement was Edison Thomas, at that time superintendent of the Jermyn Colliery of The Hudson Coal Company. He realized that the life of the local coal-mining operation

(Continued on page 50)

Blasting A New Route to DEATH VALLEY

Some of the details involved in the construction of a new, modern roadway through steep slopes and deep gullies

GEORGE H. STURTEVANT*

THE JAYHAWKER TRAIL: This aerial view above Slate Range Crossing shows a completed section of the new Jayhawker Trail. The Argus Range at the left hems in the limitless Panamint Valley. The Panamint Range, not visible in the picture, is at the right.

In the fall of 1947, when the Swedlow Engineering Company of Van Nuys, California, successfully bid the first 4.7-mile contract for the construction of a new entrance road into Death Valley, it almost bit off more than it could chew. However, with dogged perseverance and the successful application of modern explosives and blasting techniques, it helped to open a new, modern gateway into California's Death Valley National Monument by the fall of 1949.

The California Highway Patrol estimates that as a result 75,000 tourists will enter the valley each year, by the newly named Jayhawker Trail.

Actually, it required two years and four construction firms to forge this new route from Trona, across Slate Range Crossing and Panamint Valley, to the national monument entrance at Wildrose Canyon. Of the four firms working on the construction of the road, on three separate contracts, the Swedlow Company had the smallest share in miles, but the largest share in headaches, heartbreaks, and hard work. The other three contractors on the job were Arthur Johnson Construction Company, of Laguna; Dicco, Incorporated; and Dix-Syl Construction Company, the last two from Bakersfield. The Johnson firm worked a 15-mile stretch of the new road on the floor of the Panamint Valley, with little blasting called for. The Dicco Dix-Syl combination, with a joint contract to construct the final 5.7 miles of new highway, was largely responsible for the improvement of a roadbed already in existence that led from Panamint Valley to the Wildrose Canyon entrance of Death Valley. The construction details on this job were relatively uncomplicated.

The Swedlow contract, covering the southern 4.7 miles of the job, was a

* Editor, Trona Argonaut, Trona, California

DEEP ROCK CUTS. The skillful application of modern drilling and blasting techniques helped the contractor maintain satisfactory progress in construction schedules.

tough not to crack. Starting in arid Searles Valley, located in the northwestern portion of the Mojave desert, a roadbed was built up the southern wall of bleak Slate Range and down the rugged, rocky north wall into Panamint Valley, encountering en route what Job Superintendent R. F. Murphy described as "some of the toughest, most difficult rock formations in the country."

A Federal Aid Project

The $285,000 federal aid project had been authorized by the California Division of Highways as a means of providing quicker and easier access to famed Death Valley, to the people approaching from southern California. Roughly, its alignment followed an existing desert trail that dated back to the days of Panamint City's silver boom in the 1870's. Known originally as the Nadeau Road, the old trail weaved and curled over Slate Range, at times reaching a grade of 26 per cent. But the artery that had proved satisfactory for freight shipments in the 1870's proved inadequate for efficient automobile travel 80 years later. The 40-mile stretch from Trona to Wildrose Canyon took upward of 3½ to 4 hours to negotiate by the miners and other desert citizens who were practically its sole users.

Moving onto the section in January, 1948, the Swedlow crew soon found that the job was no sinecure. Progress was satisfactory in the softer rock formations on the south face of Slate Range Crossing where, according to Superintendent Murphy, the blasting operations resulted in very good fragmentation. But when they began to work down the northern face, they found themselves in one of the most complicated geologic formations they had ever encountered.

Panamint Valley has been described by Naturalist Floyd Keller as a geological replica of Death Valley, which lies just a few miles to the eastward. Evidences have been found in both valleys of geologic formations representing a tremendous span of time, including all the great divisions and subdivisions of geologic time.

"Our biggest headaches were the durite formations," Murphy said. "The texture of these rocks was so hard that a ¾-in. penetration with a rock bit that noramlly would give 10 ft. to 12 ft. of hole was not uncommon."

Adding to the contractor's woes were steep slopes and deep gullies requiring large-scale cut-and-fill operations, involving considerable overhaul.

President Leonard Swedlow originally had expected to use conventional detachable bits on his drill steel. But after a few heart- and drill-breaking days, he and Murphy had to cast around for an alternative. The bits that had worked so well for them on other rock couldn't stand the gaff in the stubborn durite. Orders for Carbide rock bits costing $15 each were placed for air mail shipment from the East. Even these sturdy bits found the going tough; some became hopelessly stuck in the drill holes and had to be abandoned.

Drilling and Blasting

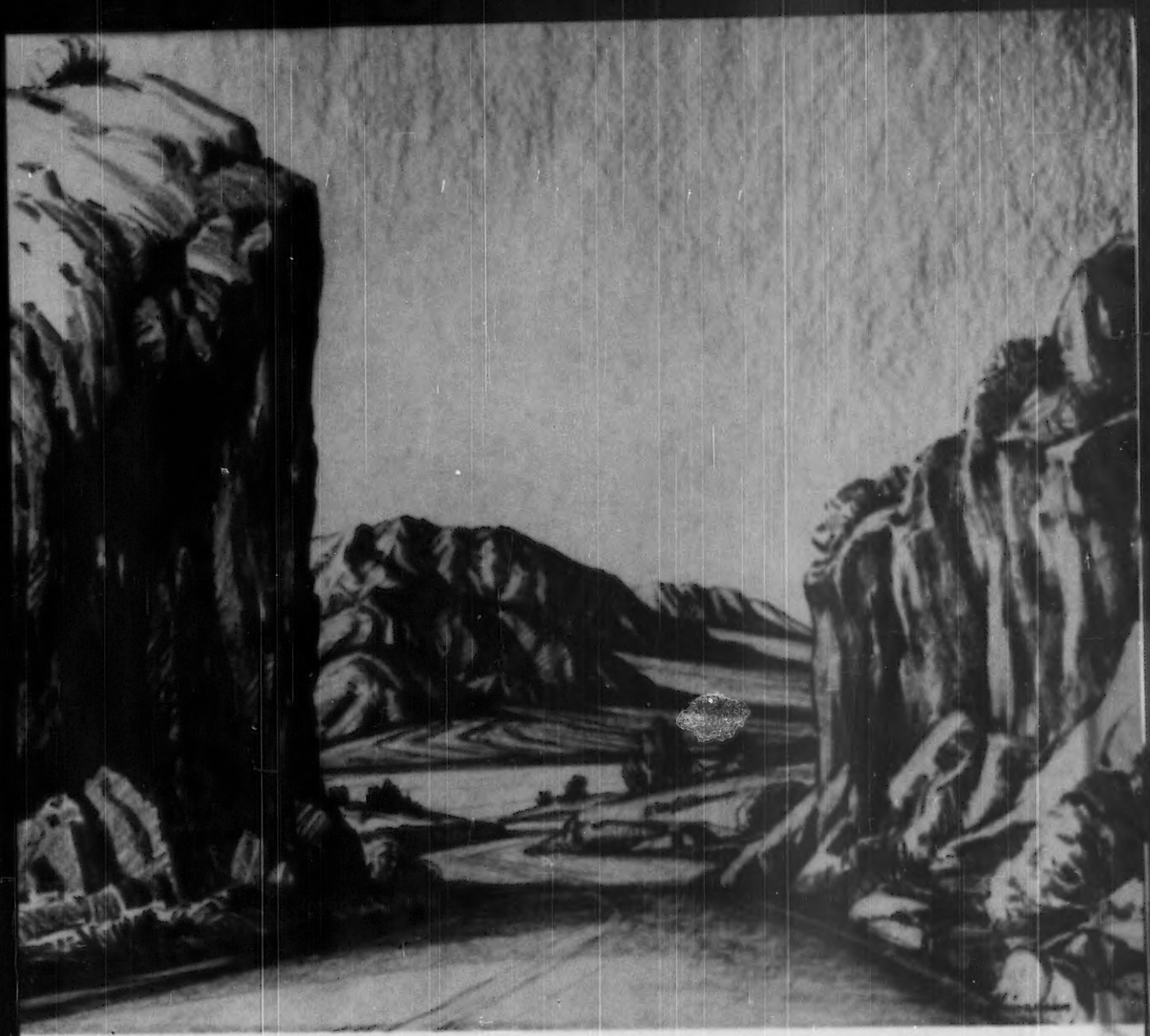
In blasting the rock along the right of way, Gardner-Denver wagon drills and rock drills, powered by three 500-c.f.m. Gardner-Denver compressors, were employed to drill three rows of holes, each hole 30 ft. deep, spaced on 12-ft. centers. The holes in the middle rows were staggered between the holes in the front and back rows. When extremely hard durite was encountered, the Carbide rock bits were required on the drill steel; where the rock was not so hard and tough, conventional detachable bits were used.

Each drill hole was loaded with a carefully calculated charge of Hercules 40% and 60% strength dynamites, using a ratio of 1.25 lbs. per cu. yd. in the durite and .75 lbs. per cu. yd. in the not-so-hard formations. The charges were primed with electric blasting caps and the holes were stemmed to the collar with sand. As many as 100 holes were fired at a time, with the leg wires of the electric blasting caps hooked up in a series connection. Excellent fragmentation was obtained, with the exception of some larger breakage in the more complicated formations.

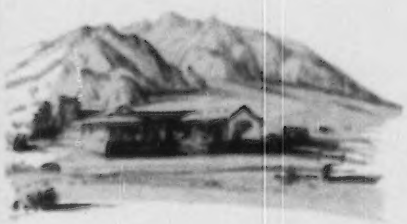
When the work was completed, not too far behind schedule, a banked, oiled-surface roadway, with a maximum grade of only 6 per cent, had replaced the old Nadeau freighting road, and a new entrance into the country's second largest national monument had been established.

What the Swedlow Company and the other construction firms had accomplished on this job is a measure of the contribution to a better

(Continued on page 51)



Explosives Bring Life to Death Valley



A PORTFOLIO OF ORIGINAL DRAWINGS BY LOUIS HEINZMAN

THE majestic grandeur of Death Valley National Monument, California, could never have been accessible to its hundreds of thousands of visitors if dynamite had not blasted roads through formidable mountain ranges that hemmed in pioneers of a hundred years ago.

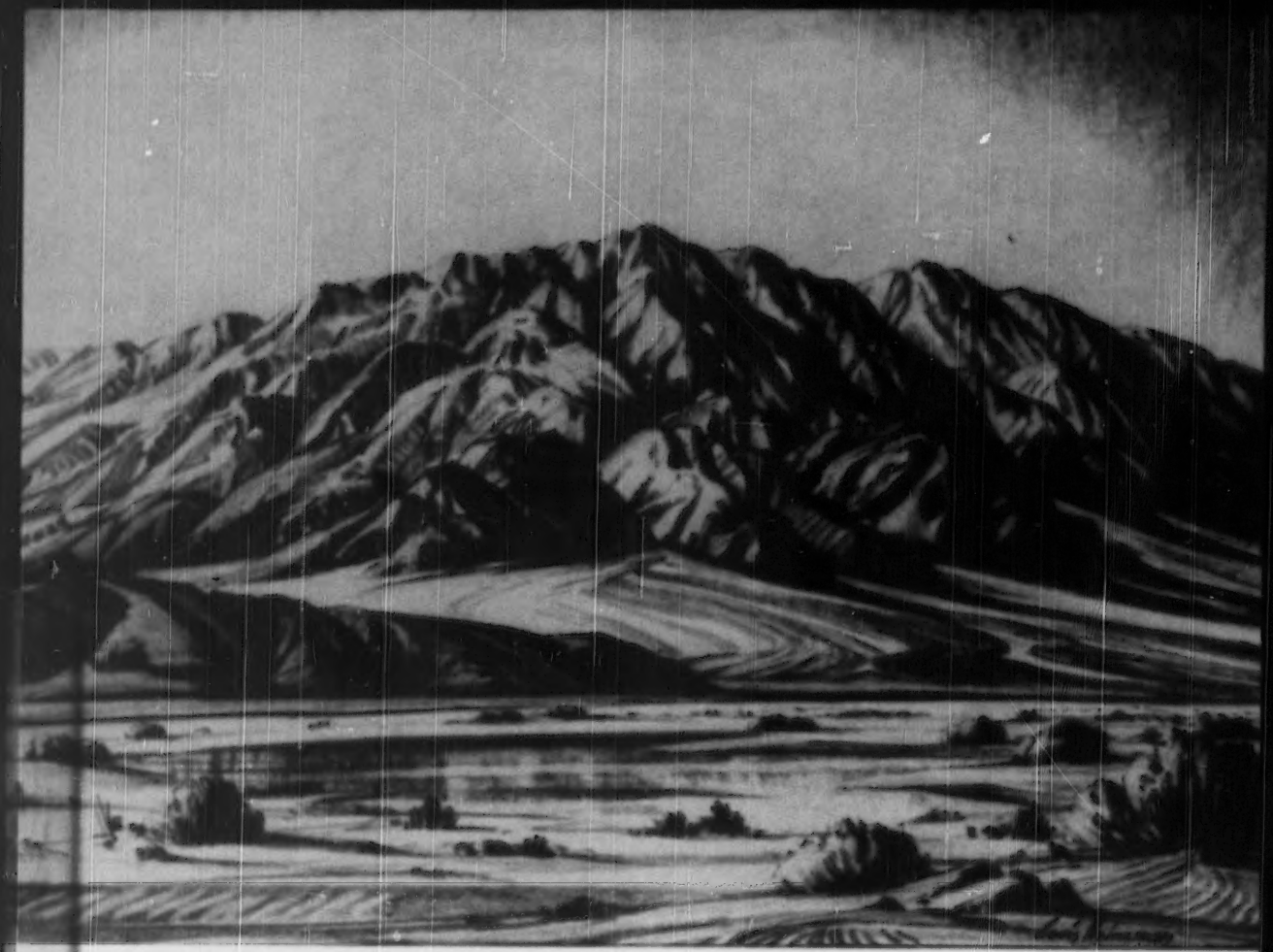
Stove Pipe Wells, popular Death Valley resort, is picturesquely situated near spectacular sand dunes and wondrous Mosaic Canyon. Its name is derived from lengths of stove pipe used by prospectors to mark a nearby spring.

THE "tallest" mountains in the U.S.A. rise abruptly from the salt-caked floor of Death Valley. From 279.6 ft. below sea level at its lowest point (Bad Water) to 11,045 ft., its highest point (Telescope Peak), is the greatest difference in land height in this country. Other mountains are higher, but, because they rise from a plateau, they are not so "tall."

Luxurious is the word for Furnace Creek Inn, owned and operated by Pacific Coast Borax Company, near the site of the spring that nurtured the Manley-Bennett Party in the winter of 1849. It was this group that gave "Death Valley" its name.

"Scotty's Castle" is almost as fabulous as its namesake, Death Valley Scotty. Erected and furnished at an estimated cost of $2,000,000, it is probably the outstanding man-made attraction of visitors to Death Valley.

NOWHERE in this country are sand dunes more sweeping than in the northern end of Death Valley. Forty to fifty feet high, with great curving contours, they display an infinitely changing pattern in lights and shadows, especially just after dawn and just before sunset.



GREAT alluvial fans, a below-sea-level desert, 608 varieties of plants, canyons with nearly perpendicular walls opening to kaleidoscopic colors, the jagged Funeral, Black, and Panamint Mountain ranges in continually changing blues, purples, and pinks, and contrasting marching shadows—these are but a few of Nature's phenomena laid open to Monument visitors by the civilizing effect of dynamite.

Furnace Creek Ranch boasts a store, cottages, hotel, and an irrigated date ranch. Dynamite is used periodically to help prepare the soil for better growing of the transplanted Old World palms.

Blasting A New Route to DEATH VALLEY

(Continued from page 46)

way of living made possible by the efficient application of explosives and modern drilling and blasting methods, plus the sweat of hard-working men.

In this case, the construction crews opened an avenue to more of our American scenic wonders. They had done such a satisfactory job of it that thousands of automobile and house-trailer tourists utilized it during the recent December 3, 1949, Death Valley Centennial celebration, which coincided with the official opening of the Jayhawker Trail.

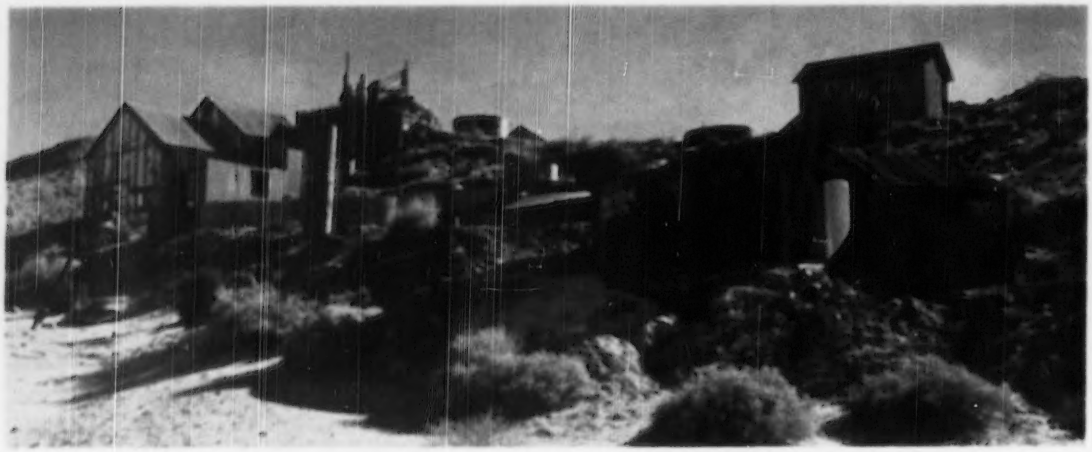
Routes to the Jayhawker Trail

In traveling to Death Valley, the Jayhawker Trail can be reached easily from Highways 6 or 395, both north-south arteries lying to the west of Death Valley. From Highway 6, the approach can be made by turning eastward at Inyokern, thence to Ridgecrest and Trona, or through the Rand Mining District, passing through Randsburg, Johannesburg, and on to Trona. From Highway 395, all that is required is to turn eastward at Johannesburg, and proceed to Trona.

Whether you approach by Ridgecrest or the Rand Mining District, the

THE OLD AND THE NEW: The old dirt road, center foreground, meanders upward toward Slate Range Crossing with an 18-per cent grade. The new trail, emerging at right, continues down the slope with a maximum grade of 6 per cent.

MOSAIC CANYON: A close-up indicates the effect of thousands of years of water erosion on the rock in the canyon. The cream-colored formation is marble; the dark rock is volcanic overlay.



RELIC OF THE PAST: The remains of an abandoned gold-mining venture near Emigrant Springs is one of the picturesque sights along the new Jayhawker Trail.

eastbound roads take you to Searles Valley, an engineer's delight. Here lies fabulous Searles Lake, a thick, flat deposit of alkaline salts, the world's greatest commercial deposit of diversified chemicals. Formed by extensive alluviation during the late Tertiary and early Quarternary periods, the lake, covering an area of 12 sq. mi., is apparently dry. But chemical plants located at Trona and Westend pump brine from deep wells, from which chemicals are processed by unique methods.

The road connects with the Jayhawker Trail 4 miles out of Trona and leads to the top of Slate Range Crossing, which affords a breath-taking view of Panamint Valley. More than 60 miles long and 5 to 6 miles wide for the greater part of its length, Panamint is a comparatively deep, narrow basin, with abrupt rock walls contrasting with broad alluvial slopes.

Here, the traveler with a few extra hours and a yen for exploring the past can detour to the old ghost towns of Ballarat and Panamint City. Named for a famous Australian mining camp, Ballarat emerged as a supply center when gold was discovered in the area, in 1895. Gold flurries kept the town booming until the end of World War I, when the high grade ran out and Ballarat all but died. Where once 2,000 persons lived and seven saloons flourished, only one citizen remains among today's adobe ruins.

Panamint City is a little harder to get to. A torturous, frequently washed-out road is best navigated by jeep, although a skilled driver in the usual passenger-type car can make it. Tall brick smokestacks and old smelting vats are all that remain today of a gigantic 20-stamp mill, erected in 1875, to extract silver from the rich ore once prevalent here. In its heyday, Panamint City was one of the wildest of mining camps—even Wells Fargo refused to extend its express service to it. As a consequence, the city's silver shippers were forced to an ingenuous solution of their freighting problem: they cast the silver bullion into huge cannon balls, weighing nearly a quarter of a ton each, and had their silver transported through robber-infested country in unguarded open wagons.

Travelers who are rockhounds can profit by stopping at Wildrose Station, just inside the monument boundaries. Here, a unique collection of desert rocks and gems is assembled, and information can be obtained about locations of mineral deposits.

DESERT MOUNTAINS: Looking north in Death Valley, from Aguereberry Point, at the foothills of Tucki Mountain, with the northern reaches of Funeral Range in the background.

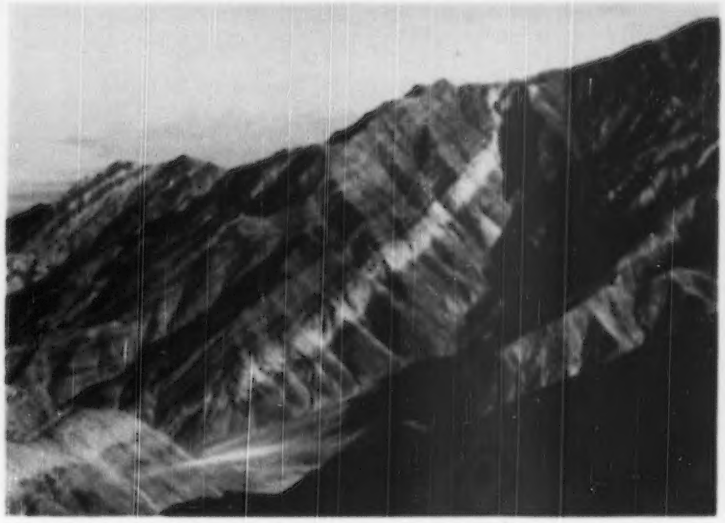
Farther up Wildrose Canyon, ten huge charcoal kilns built by Chinese labor in 1870 are located. The beehive-shaped ovens produced charcoal for use in the silver smelters; they are symbolic of the activity that once flourished in this apparently desolate area. Just beyond the kilns lies Mahogany Flat, which presents a beautiful panorama of Death Valley. Another view, even more striking, can be obtained at Aguereberry Point, which lies to the east of the road that leads to Stove Pipe Wells Hotel.

Stove Pipe Wells is located at sea level, well within the boundaries of Death Valley proper. Behind it lies scenic Mosaic Canyon, a deep, narrow gorge carved out of solid cream-and-chocolate marble. Also, water-polished conglomerate is visible, the matrix of which holds pebbles of strongly contrasting colors. Most unusual of all are the thin slabs of limestone that ring like a silver bell when struck with a metal object.

Death Valley Scotty

Directly north of Stove Pipe lies the valley's most photographed area, a landscape of wind-rippled sand dunes with graceful curves and contours that change endlessly with the movement of the sun.

At the northern end of Death Valley is fabled Scotty's Castle. Privately owned, it has the appearance of a medieval stronghold. It is only slightly less fantastic than the country around it. Nearby is Ubehebe Crater, a deep, multicolored bowl formed by a volcanic explosion.



TYPICAL FORMATIONS: A photograph taken from fabulous Aguereberry Point reveals the intense stratification of the rock formations in the area.

The central and southern sections of Death Valley are honeycombed with points of interest, both natural and man-made. The exploitation of borax here in the 1880's eventually led to the development of the area. Previously, the valley had been of interest only to prospectors searching for gold and silver. Only a few precious metal mines (including the Keane Wonder and Skidoo strikes) were ever located, despite Death Valley Scotty's oft-repeated insinuations to the contrary.

Actually, it was borax that brought the valley into the civilized orbit and gave rise to an extensive folklore. Still to be seen today are the Harmony Borax Works, the Eagle Borax Works, and the old narrow-gauge railroad that once hauled the product.

A unique resort is located at Furnace Creek at the point where the first white men entered in 1849, as they stumbled westward toward the gold fields. It was members of these pioneer prospectors who, looking back

IN THE VALLEY: Stove Pipe Wells Hotel is the first stopping place for visitors entering Death Valley National Monument over the new Jayhawker Trail.

upon it from the top of the Panamints after weeks of suffering, gave Death Valley its name.

Today at Furnace Creek stands a beautiful inn, a luxurious hotel, and Furnace Creek Ranch that features cabins of all types, a store, a gas station, a grass golf course, an airport, and riding stables.

In the immediate vicinity are such points of interest as Gnomes' Workshop, Mustard and Golden canyons, and Mushroom Rock. Others include Zabriskie Point, which overlooks highly colored badlands carved and eroded in an infinite variety of shapes, and Dante's View, the eastern counterpart of Aguereberry Point. From this view one can see, at a single glance, both Bad Water and Mt. Whitney, the lowest and highest points in the United States.

Bad Water is another major point of interest. A briny pool 279.6 ft. below sea level, it is surrounded by the third lowest dry land surface in the world. Artist's Drive, which leads off from the road to Bad Water, affords a brilliant vista of the multicolored eastern wall of the valley. Other interesting places nearby are the salt pools, Devil's Golf Course, Bennetts Wells, and the settlements of Ryan and Death Valley Junction. In addition, the entire monument area is honeycombed with ghost towns and prospect holes, of special interest to mining men. Among these are Skidoo, Rhyolite, Greenwater, and Bullfrog.

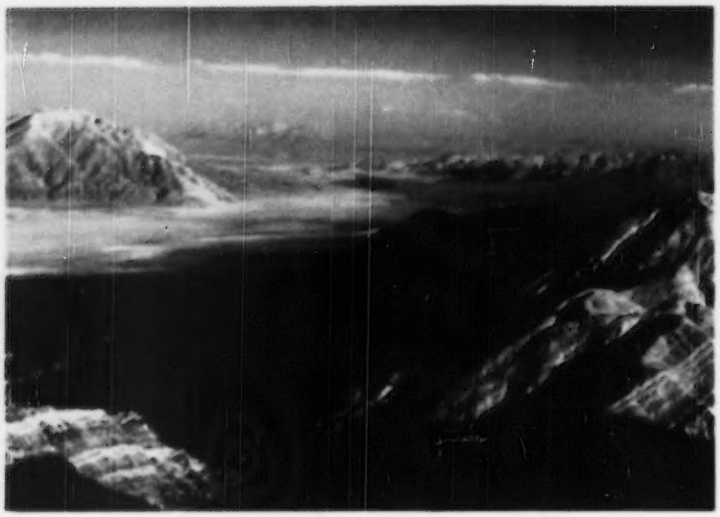
An Ideal Tourist Mecca

Despite its somber name, Death Valley today is an ideal tourist mecca. Established as a national monument in 1933, it boasts a year-round park-service force, trained and equipped to assist the traveler. Park rangers stationed at various points throughout the monument are charged with the visitor's safety, and with the protection of the natural wonders. The Naturalists' service offers evening lectures on the history of natural phenomena, at Stove Pipe Wells Hotel and Furnace Creek Inn. Free public camp grounds are provided for those who like to rough it in the wide open spaces.

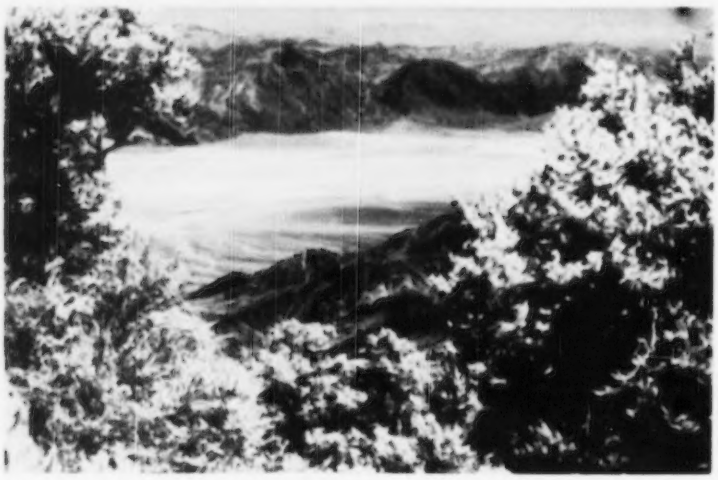
Death Valley weather is something special. In summer, thermometer readings of 120 degrees and higher are not rare, while the humidity runs from 0 to 12 per cent. However, in the tourist season, between October and May, the weather is invigorating, with the thermometer lurking around the 80-degree mark.

The popular belief that nothing lives or grows in Death Valley is disproved by the record. Twenty-six species of mammals have been identified below the sea-level contour, with many more living at higher elevations. In evidence are kangaroo rats, ground squirrels, fox, and coyotes. Lizards, of course, abound, as do birds, including a large number of water fowl during migrating seasons. There are 608 varieties of flowering plants including primroses, phacelias, and desert sunflowers. Then there are the creosote bush, desert holly, Death Valley sage, and several species of cacti.

This, then, is the fabulous country that has been made more readily accessible by the construction of a new, modern highway—the Jayhawker Trail.



DEVIL'S GOLF COURSE. Looking southeast from Aguereberry Point across Devil's Golf Course in Death Valley, during the latter part of the evening.



FROM MAHOGANY FLAT. A photograph across Death Valley, taken from picturesque Mahogany Flat in the Panamint Range—scene of many a prospector's trek during the last century. Bad Water and Dante's View are in the background.

QUARRYING LIMESTONE IN MEXICO

Primary blasts average four tons of stone for each pound of explosives loaded

ALBERT S. KESHEN*

DRILLING: For primary blasts, 6-in.-diameter holes are drilled vertically into the ledge of limestone by two 27-T Bucyrus-Erie churn drills.

MEXICO'S largest commercial quarry, located at Tolteca, State of Hidalgo, 50 miles north of Mexico City, is operated by La Tolteca, Cia. de Cemento Portland, an independent company with headquarters at San Pedro de Los Pinos, Mexico City. The quarry site is at an elevation of 6,770 ft., in a picturesque valley of the eastern range of the Sierra Madre. The surrounding countryside is rich in historic Indian lore, being the former capital of the Toltec Empire, a mighty Indian tribe which preceded the Aztecs. A nearby Indian pyramid is visited frequently by archaeologists and tourists. After blasts are made in the quarry, it is not unusual for workmen to dig out relics of the ancient tribesmen.

The geological formation in the quarry consists of layers of black limestone, 4 ft. to 10 ft. wide, with varying layers of blue limestone. The stratification is perpendicular, with a slip of about 70 degrees to the vertical. As a result, after primary blasts are made, considerable toe is left at the bottom of the working face. These toes are removed by secondary drilling and blasting.

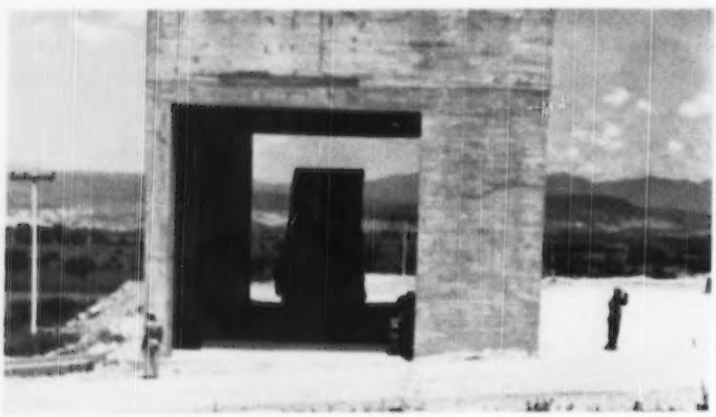
In making the primary blasts, 6-in.-diameter holes are drilled vertically into the rock by two 27-T Bucyrus-Erie churn drills, powered by two 15-hp., 440-volt motors. The holes, bottoming about 2½ ft. below the quarry floor, are spaced on 20-ft. centers, with an average burden of 18 ft. The drills make about 3½ ft. of hole an hour on an 8-hour-shift basis, including bailing out occasional caves which they penetrate from time to time. In soft rock, it is possible to drill 50 ft. of hole a day; in the tough blue limestone, drillers complete about 12 holes a week, working an hour a day. Dulled drill bits are reconditioned in the company shop where they are sharpened

EXCAVATING: After a blast in the quarry, the broken stone is loaded out by a 2½-cu. yd. 54-B Bucyrus-Erie electric power shovel into 14-ton Euclid Diesel rear-dump trucks.

*Cordoba 5-A, Mexico, D. F.

STRAIGHTENING THE FACE. Chicago Pneumatic jackhammers, powered by a CP compressor, are used to drill smaller holes for blasting the toe at the bottom of the quarry face.

LEFT TO RIGHT: J. F. McCarthy of control department; A. B. Stewart, general superintendent; and Luis Elek, works manager.



CRUSHER NO. 1. A Euclid truck dumping stone into an Allis-Chalmers gyratory crusher near the quarry.

with a No. 12 Bucyrus-Erie machine and immersed in brine.

Loading the Explosives

The drill holes are column-loaded with explosives, each receiving a charge of 325 lbs. of dynamite. The loading procedure consists of placing 150 lbs. of 60% ammonia gelatin in the bottom, followed by 125 lbs. of 40% ammonia gelatin and a final charge of 50 lbs. of 40%. Extra dynamite loaded 20 ft. from the collar of the hole. The dynamite is rather loosely packed in 5-in. by 16-in. cartridges. The charges are primed with Primacord and stemmed with rock dust from the drill cuttings. Blasts are fired by a conventional blasting machine.

"In making 12-hole primary blasts we get about 4 tons of broken stone for each pound of explosives used," said Superintendent Tempest.

To take out the toes left from the primary blasts and in reducing the larger boulders, holes are drilled with Chicago Pneumatic jackhammers, powered by a CP compressor. The holes are loaded with smaller, standard-sized cartridges of dynamite, and blasts are fired with safety fuse and blasting caps.

Excavating and Hauling

After blasting, the broken rock is loaded out by an electrically operated 2½-cu. yd. Bucyrus-Erie 54B shovel into three 14-ton Euclid Diesel-powered rear-dump trucks. The shovel handles 160 tons an hour. The rock is transported a short distance to the first crusher and dumped into a 42-in. Allis-Chalmers covered gyratory crusher. After reduction to about 6 in. in size, it is carried by a 35-in. conveyor belt to a second crushing plant equipped with two Symons 4½-ft. cone crushers. These crushers are fed by apron feeders that deliver 1½-in. material to a 36-in. conveyor belt, which discharges into a 600-ton bin arranged to load three Euclid 40,000-pound, bottom-dump trailer trucks simultaneously. From the bin, the crushed stone is trucked over a concrete road for 3 miles to the cement plant across the Tula River, for final processing.

The Plant

Early in 1949, modern machinery and time-saving equipment were installed in the various units in the plant. As a result, it is the only completely mechanized plant, as well as the largest, in Mexico. The mechanical improvements upped production to 20,000 tons of cement a month and made possible a reduction in the working forces from 250 to 50. The total number of company employes, including those at the Mexico City plant, adds up to approximately 500.

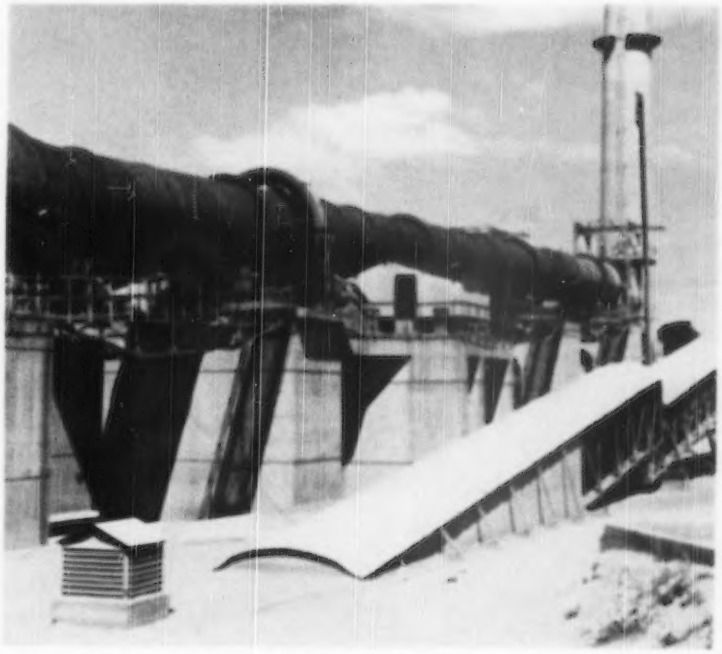
The Tolteca mill, located about three miles from the limestone quarry, is connected to it by a concrete road. It uses two wet and four dry kilns. Clay is obtained from an extensive deposit a few hundred yards west of the plant. It is of residual origin, usually plastic, and capable of wash-mill treatment. The gypsum comes from a quarry at Salitrillo, which is about 5 miles from the mill.

Rail transportation is furnished by the main Mexico City-Juarez branch of the National Railways of Mexico, with a station stop at Tolteca, directly across from the plant's office. Cooling water for kiln and mill bearings is obtained from an artesian well, with a flow of about 300 gallons a minute. This is sufficient, with recirculation, for industrial and domestic requirements. Water for the slurry is obtained from the Tula River, under a government concession. It is pumped through 6-in. pipe lines to a 30,000-gal. storage tank located on the top of the clay bank. From this tank, the required slurry water flows by gravity into a clay wash mill.

Electric power is furnished by a cement plant substation serviced by the Pachuca Light & Power Company, at 22,000 volts, 50 cycles. The operating company has been careful to insure maximum possible safety against electric shocks and burns, through the installation of interlocks and safety devices, in strict compliance with the exact specifications of the electric-safety code of the British Standard Institutions.

The combination of careful planning and the employment of modern equipment and operating methods has made it possible for La Tolteca, Cia. de Cemento Portland to supply construction materials to help accelerate Mexico's industrialization campaign, which is at present undergoing an intensive revitalization.

TWO-STAGE CRUSHING UNITS. After the initial crushing, the stone is conveyed to a second-stage crusher at right.



AT THE CEMENT PLANT. This view from one side of the cement plant shows the clinker conveyor to the mill room.

The principal officers of La Tolteca, Cia. de Cemento Portland are Kenneth Bannister, president; Luis Elek, works manager; and Arthur B. Stewart, general superintendent of quarry and mill operations.

Mining Coal Underground

(Continued from page 42)

central preparation tipple, after which it is loaded into railroad cars for shipment to the market.

The grade of permissible explosives selected by the company for improved loadability and preparation is Hercules Red H* L. Each charge is stemmed to the collar of the drill hole. The detonators used are Hercules* No. 6 Electric Blasting Caps with 10-ft. iron leg wires.

The Collier mine, referred to as the First Island Mining Project in the West Virginia Panhandle, produced its first coal on February 15, 1948. With competent management and close supervision, production figures to date have shown a steady increase, with the daily tonnage averaging 2,500 tons for 1949.

The central offices of Penowa Coal Company are in the Grant Building, Pittsburgh, Pennsylvania. The officers and supervisory officials include Leonard Sasso, president; J. E. Anderson, general manager; John W. Long, mine superintendent; Edward Orrell, mine foreman; Joseph Cass, chief assistant mine foreman; and Andrew M. Gardner, purchasing agent.

* Reg. U. S. Pat. Off.

LEONARD SASSO
President, Penowa Coal Company

ANDREW GARDNER
Purchasing Agent for the company

LEFT TO RIGHT: John Long, mine superintendent; J. E. Anderson, general manager; Edward Orrell, mine foreman; Joseph Cass, chief assistant mine foreman.

PENOWA MINERS: One of the crews, with supervisors, registering pride in maintaining a high rate of coal production safely.

Coal Miners Pay Tribute to the Founders of First Aid

(Continued from page 44)

was rapidly coming to a close. Influential citizens joined with him in promoting interest in the plan. Had there been a delay of a few years, the chances are that the town of Jermyn would not have become recognized nationally as the birthplace of first-aid training. The monument became a reality and its dedication was an occasion of deep significance.

Those who wish to pay tribute to the memory of the pioneers of first aid can do so by visiting the monument on the greensward next to the Jermyn Community House, as thousands did on the 50th anniversary day, December 15, 1949. Edward N. Stuart and James O'Dowd, two of the three surviving members of Dr. Shield's original class, placed a wreath at the base of the monument and Edison Thomas, chairman of the celebration, spoke. He compared first-aid treatment in the early days, when he first came to Jermyn in 1901, with present-day methods as practiced at the Marvine Colliery, Hudson Coal Company's modern operation in Scranton, where he is now superintendent.

The climax of the day's program was a huge banquet in the Jermyn High School. Approximately 350 guests partook of a delicious dinner at candlelighted tables and enjoyed speeches by Dean Edward Steidler, of Pennsylvania State College of Mines; E. H. McCleary, U. S. Bureau of Mines; and Dr. Carl Potthoff, director of first aid, The American Red Cross. Richard Maize, state secretary of mines, presented attractive trophies made from coal to the surviving members of Dr. Shield's first class. Judge M. J. Eagen, Lackawanna County Court of Common Pleas, was the toastmaster.

Today, the townspeople of Jermyn hold their heads higher than usual. They realize that if Dr. Shields had not come to town to practice medicine in their midst, he might never have initiated one of the greatest crusades of the past 50 years. It was among them that he became aware of the need for first-aid training and accident-prevention regulations. It was there that he became a true sentinel of safety.

A MEMENTO: Richard Maize, right, Pennsylvania's secretary of mines, presents a trophy made from coal to Edward N. Stuart, youngest member of the original first-aid class of 1899.

FIRST-AID DEMONSTRATION: Mr. Stuart and Mr. O'Dowd watch members of a modern first-aid team apply artificial respiration to a teammate.

Security vs. Opportunity

(Continued from page 39)

I have no patience with those who complain about the passing of the good old days, and who fail to see the opportunities of today.

Today, admittedly, the empty places are less vast and they are more easily reached. The quick harvest has, of course, been garnered. But, in every other respect, what a tremendously greater new age this is!

We may run out of this or that element in cheaply recoverable forms, but when this happens other ways and means, controlled by the stern effects of supply and demand, will surely be worked out. We may be sure they will be found. Science is advancing at a breath-taking rate and industry is keeping pace with it—and now and then even recklessly running ahead and showing the way.

We haven't begun to appreciate the full measure of the superficial layer of the planet that is accessible to us. The layer is thin, although comparatively, even our deepest borings and shafts are only pin pricks, but its content of useful substances is immense and their nature tremendously varied. Specific metals may indeed become so scarce as to put them in price classes very different from those that prevail today, but that doesn't mean that our civilization will end. It does mean that others will be found and used—probably by techniques still to be discovered—but found and used they will be.

Anyone who feels that the time of opportunities for brilliant new achievements has passed in our field is blind. They are greater than ever. Surely the dull prospects of security—even with a bungalow in certain overgrown areas in sunny climates—must not be allowed to deaden the enthusiasm for daring undertakings.

Ages of opportunity and adventure are of course ages of danger. Has there ever been a time of greater peril than the present? The growing knowledge of nuclear physics has given us one devastating explosive and has promised us new ones that make the risks of war far more terrifying than those of the worst coniscy of the past.

Perhaps we should not even deny the entertaining possibility of blowing up the entire planet. Perhaps the purpose of this green ferment called life on the planet is simply to serve as a detonator and explode the solar system into a new star—a brilliant nova, comparable to those that the astronomers report now and then. If so, it is really a tremendous destiny and an immense privilege to participate in it.

But on a more humble scale I am willing to be content with the less spectacular achievements that can come to us through the expanding science and technology of the times. The risks—social, political, and military—are all too apparent. But, so are the prospects for a continued civilization far superior to anything in the past. And, it is not merely a Pollyanna attitude to insist that the opportunities for new advances or for a better life on the planet far outweigh those of disaster.

I congratulate my generation for having persisted into this age, and I congratulate our younger members for the prospects they have. It is an age worthy of true adventurers.

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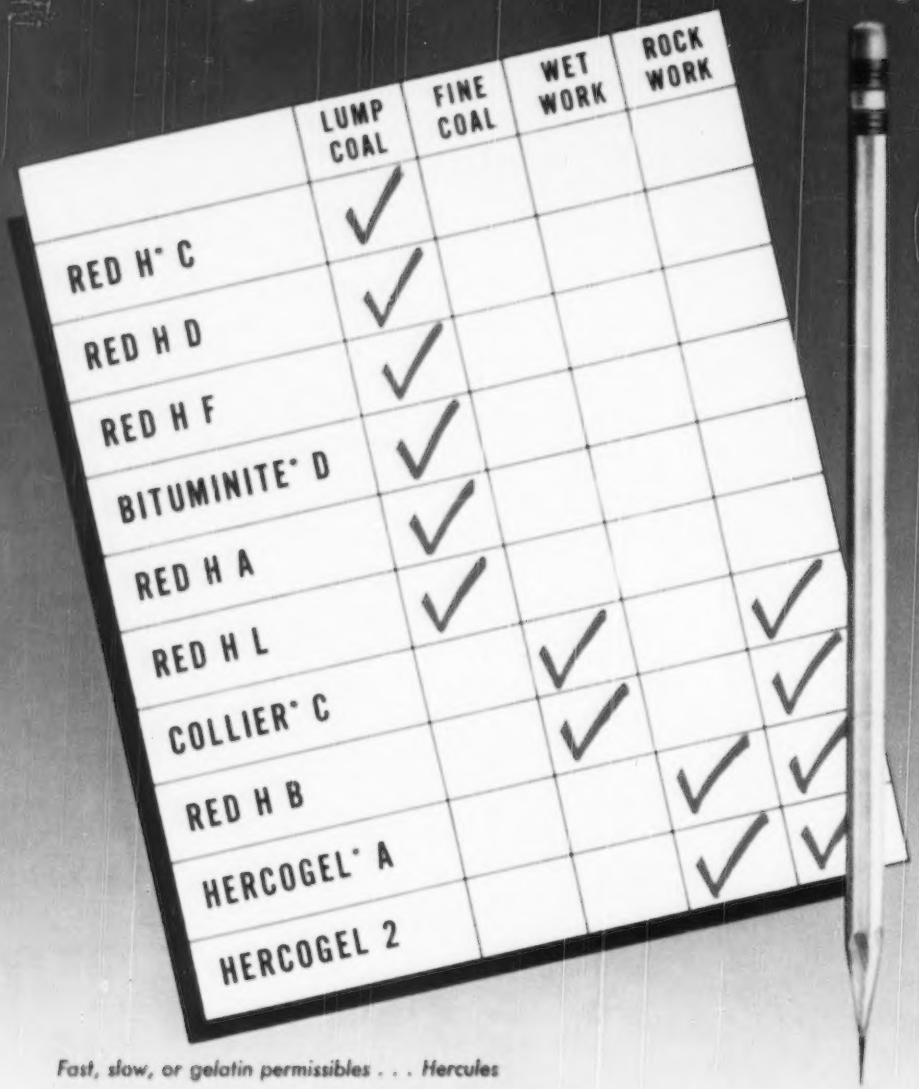

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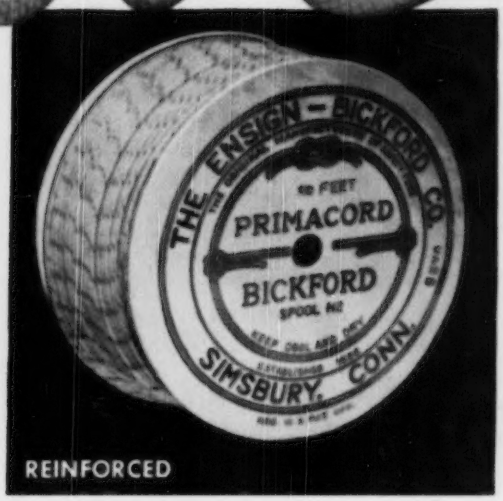

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